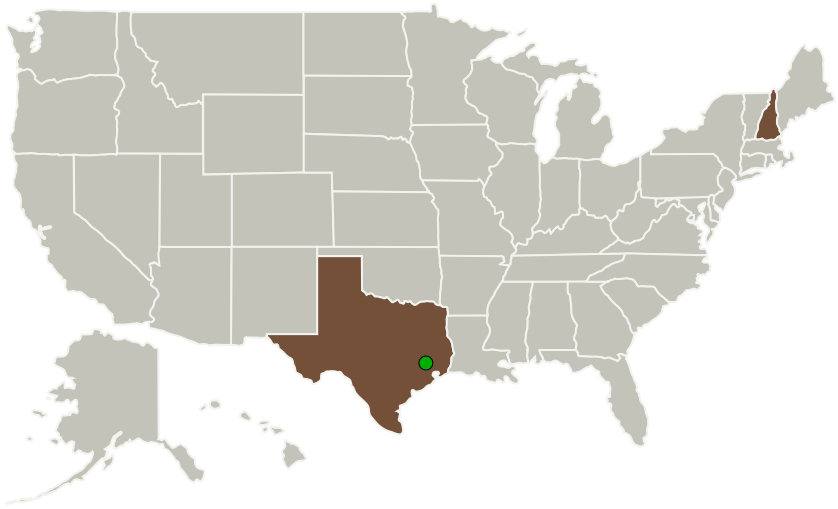
A Multi-Environment Thermal Control System With Freeze-Tolerant Radiator, Phase I

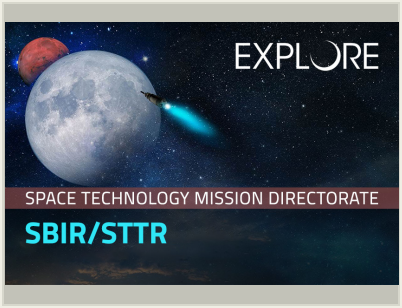
Completed Technology Project (2012 - 2012)

Project Introduction

Future space exploration missions require advanced thermal control systems (TCS) to dissipate heat from spacecraft, rovers, or habitats to external environments. We propose to develop a lightweight, reliable TCS to effectively maintain cabin and equipment temperatures under widely varying heat loads and ambient temperatures. The proposed system uses freeze-tolerant radiators, which eliminate the need for a secondary circulation loop or heat pipe systems. Each radiator has a self-regulating variable thermal conductance to its ambient environment. The variable conductance will enable the TCS to maintain the cabin and equipment at a tightly controlled temperature. The TCS uses a nontoxic working fluid that is compatible with existing lightweight aluminum heat exchangers. The TCS is lightweight, compact, and requires very little pumping power. In Phase I, we will prove the feasibility of our approach through performance demonstration of a key component in the TCS system and detailed system design and analysis. In Phase II we will build a TCS demonstrator and obtain test data to show its unique performance advantages.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
New Hampshire	Texas

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137834)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

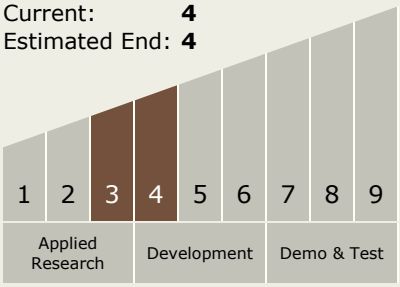
Carlos Torrez

Principal Investigator:

Weibo Chen

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System